71. The method of claim 47 wherein selectively engaging comprises selectively lowering the refurbishing element towards the polishing pad while the wafer carrier presses a wafer against the polishing pad and moves the wafer over the polishing pad to polish the wafer.

72. The method of claim 47 further comprising selectively disengaging the refurbishing element from the pad.

73. The method of claim 49 wherein the refurbishing element is selectively disengaged from relatively unused portions of the polishing pad not having accumulations of waste matter.

74. The method of claim 47 wherein the selectively engaging comprises lowering the wafer carrier until the refurbishing element and a wafer abut the polishing pad.

75. The method of claim 47 wherein the refurbishing element is selectively engaged with deteriorated portions of the polishing pad with accumulations of waste matter.

76. The method of claim 47 wherein the refurbishing element is selectively engaged and disengaged from the polishing pad as a function of the use of portions of the pad. - -

REMARKS

Claims 1-53 and new claims 54-76 are pending in the application. In the Office Action dated November 12, 2002, the following actions were taken: (1) claims 1, 3-6, 8-9, 12-13, 15-18, 20-21, 24-31, 33-36, 38-49, 42-45 and 47-53 were rejected under 35 USC §102(e) as being anticipated by Cheng et al. (U.S. 6,019,670); and (2) claims 2, 7, 10-11, 14, 19, 22-23, 32, 37, 40-41 and 46 were rejected under 35 USC §103(a) as being unpatentable over Cheng et al.

(U.S. 6,019,670) in view of Takenaka et al. (US 5,902,173). Applicants respectfully request reconsideration of the application in view of the following remarks.

Please note that Applicants filed an Amendment with the Patent Office on February 12, 2003. This Amendment, however, was not entered. Enclosed with that Amendment was a check in the amount of $666 to cover the cost of additional claims (a copy of the check is attached). The check for $666 was cashed by the Patent Office on February 27, 2003. Since the claims have already been paid for, no additional claims fees are due with this Amendment.

As requested in the Office Action dated May 5, 2003, Applicants have amended the specification to correct the typographical error made in the patent.

Also in the Office Action, the Examiner indicates that the limitation "wherein the body is movably attached to the wafer carrier" relates to subject matter previously surrendered and that this limitation is omitted in the newly added claims. The Examiner states that the Examiner's reasons for allowance in the original application indicated that it was this limitation that distinguished over the prior art of record. Because the applicant did not present comments to the reasons for allowance, the Examiner asserts that this limitation must be included in the claims or the recapture rule will be violated. It should be noted that Examiner did not formally reject any of the pending claims under 35 U.S.C. § 251 as violating the recapture rule.

The Examiner argues that the new claims attempt to recapture subject matter that was surrendered in the parent application because applicant did not comment on the examiner's reasons for allowance and have acquiesced to the reasons. The Examiner has overlooked the fact that at the time the issue fee was paid for the parent, namely, October 27, 1999, the rules regarding applicant's comments on the examiner's statement of reasons for allowance, 37 C.F.R. 1.104(e), as well as MPEP 1302.14, were different. Section 1.104(e) at the relevant time provides that "The applicant or patent owner may file a statement commenting on the reasons for allowance within such time as may be specified by the examiner. Failure to file such a statement *does not give rise to any implication that the applicant or patent owner agrees with or acquiesces in the reasoning of the examiner.*" (Emphasis added.) With respect to MPEP 1302.14, the correct version of this section is provided in the seventh edition, which is silent on the matter of any presumption of acquiescence for failure of an applicant to comment on reasons

for allowance. Thus, at the time the applicant could have submitted comments on the reasons for allowance, that is, October 27, 1999, failure to do so did not have the consequences which are present under the current rules and the current version of MPEP 1302.14. Consequently, the applicants are not now attempting to recapture subject matter that was surrendered in the parent application because applicants did not surrender subject matter in the parent application by acquiescing to the reasons for allowance provided at that time by the examiner. For the foregoing reasons, none of the pending claims violate the recapture doctrine under 35 U.S.C. 251.

Before discussing the claims rejections based upon the cited prior art, certain distinctions between the disclosed embodiments of the invention and the subject matter of the applied references will now be discussed. Specific distinctions between the pending claims and the applied references will be discussed after the discussion of the disclosed embodiments and the applied references. This discussion of the differences between the disclosed embodiments and applied references does not define the scope or interpretation of any of the claims.

Problems exist in conditioning wafers and polishing pads simultaneously. Problems also exist in conditioning areas of pads proportionate to pad surface wear. Applicants solve these problems with a polishing pad refurbisher which conditions a pad while an electronic substrate is being polished. Figure 2 depicts one embodiment of Applicants' invention including a pad refurbisher 50, having a wafer carrier 30 operable to hold a wafer 12. (column 4, lines 16-18). A body 60 is attached to the wafer carrier 30, and a distal face 62 on the wafer carrier -- along with a refurbishing element 70 held by the distal face 62 -- is positioned proximate to the surface 42 of the polishing pad 40 (polishing pad element numbers shown in Figure 1). (column 4, lines 18-23). A support member 63 is coupled to the body 60 and has a hole 65 through it to slidably receive the shaft/actuator 36 of the wafer carrier 30. (column 4, lines 59-62). The body 60 may be fixed to the wafer carrier 30, or it may be slideably attached to the wafer carrier 30 to move along a vertical axis substantially normal to the polishing surface 42 (shown by axis Z-Z). (column 4, line 35-38).

Such a configuration allows the pad refurbishing element 70 to condition a polishing pad 40 while the wafer 12 is being planarized. In one aspect, actuators 82 extend between the support member 63 and the wafer carrier 30 and can be used to move the distal face

62 and refurbishing element 72 along the Z-Z axis relative to the wafer carrier. (column 4, lines 63 to column 5, lines 2). Thus the actuators 80 may be used to lift the refurbishing element 70 off of the polishing pad 40 in areas where the polishing pad does not need to be refurbished, and to lower the refurbishing element 70 back into contact with the pad 40 in areas where conditioning is required. The actuators 80 may also control the pressure between the refurbishing elements 70 and the pad 40 to provide a substantially constant pressure therebetween when desired. (column 5, lines 27-30).

Cheng *et al.*

Cheng *et al.* teaches a conditioner for a polishing pad which is connected with a carrier head in a chemical mechanical polishing system. As best shown in Figures 4 and 6, Cheng *et al.* teaches a carrier assembly 104 including a substrate backing member 120 capable of holding a substrate 10. (column 7, lines 29-31). The substrate backing member 120 is attached to a housing assembly 102 by a cylindrical bellows 122. (column 7, lines 29-31). A conditioner assembly 108, including a conditioning ring 200, is mounted to the periphery of the housing assembly 102. (column 9, lines 8-12). A flexible bladder 250 (Figure 6) which surrounds wall 116 of housing assembly 102 may have a pressurizable core 256. (column 10, lines 29-40). When this core 256 is positively pressurized, it exerts pressure on ledge 229 and urges a lower mounting portion and an annular alignment flange 212 to which the conditioning ring 200 is attached, into contact with the polishing surface 44. (column 9, lines 34-42 and column 10, lines 29-40). To prevent rotation of the conditioning assembly 108 with respect to the housing assembly 102, a plurality of rectangular detents 270 are formed in the housing support plate 110, and a plurality of screws 272 extend through holes 274 in upper annular end portion 226 of rim 220 into the detents 270. (column 10, lines 63-67).

Cheng *et al.* does not disclose, teach or fairly suggest the inventive apparatus and methods taught by Applicants. Specifically, Cheng *et al.* does not teach or suggest a body adapted for attachment to a wafer carrier of a chemical-mechanical polishing machine with the body having a face positioned proximate to a perimeter portion of the wafer carrier and facing the polishing surface of the polishing pad. As shown in Figure 4, the conditioning assembly 108 is attached to the housing assembly 102 and not the substrate backing member 120. In fact,

Cheng *et al.* teaches away from attaching the conditioning assembly 108 directly to the substrate backing member 120 since such an attachment would be blocked by the placement of a retaining ring assembly 106. Moreover, attaching the conditioning assembly 108 directly to the substrate backing member 120 would prevent the flexible bladder 250 from performing its purpose of raising and lowering the conditioning assembly 108 relative to the substrate backing member 120.

Tanaka

Tanaka teaches a polishing machine having a dresser for dressing a polishing cloth. As best shown in Figure 22, Tanaka teaches a tool/wafer holder 40 operable to hold a wafer 45 at the inside of a guide 44. (column 6, lines 44-46). At the outer peripheral area of the tool/wafer holder 40, and on the same surface used to hold the wafer 45, a brush 47 and a lapping tool 46 respectively are concentrically provided, with the lapping tool 46 being positioned outside the brush 47. (6:51-55).

Tanaka does not disclose, teach or fairly suggest the inventive apparatus and methods taught by Applicants. Specifically, Tanaka does not teach or suggest a body adapted for attachment to a wafer carrier of a chemical-mechanical polishing machine with the body having a face positioned proximate to a perimeter portion of the wafer carrier and facing the polishing surface of the polishing pad. Rather, Tanaka teaches away from Applicants' invention by teaching the attachment of a lapping tool 46 and/or a brush 47 directly to the tool/wafer holder 40.

If the undersigned attorney has overlooked a relevant teaching in the above mentioned references, the Examiner is kindly requested to specifically point out where this teaching may be found.

I. Rejection of Claims 1, 3-6, 8-9, 12-13, 15-18, 20-21, 24-31, 33-36, 38-49, 42-45 and 47-53 under 35 USC §102(e) as being anticipated by Cheng et al. (U.S. 6,019,670); and the rejection of claims 2, 7, 10-11, 14, 19, 22-23, 32, 37, 40-41 and 46 under 35 USC §103(a) as being unpatentable over Cheng et al. (U.S. 6,019,670) in view of Takenaka et al. (US 5,902,173).

Turning now to the claims, the patentable distinctions between the claimed invention and the applied art will be specifically pointed out.

Claim 1

Claim 1 recites a pad refurbisher for in situ, real-time refurbishing of a polishing surface of a polishing pad used in chemical mechanical polishing of a semiconductor wafer, comprising *a body adapted for attachment to a wafer carrier of a chemical-mechanical polishing machine with the body having a face positioned proximate to a perimeter portion of the wafer carrier and facing the polishing surface of the polishing pad, the body being adapted to travel with the wafer carrier as the wafer carrier moves over the polishing pad wherein the body is movably attached to the wafer carrier*, and a refurbishing element connected to the face of the body, the refurbishing element being adapted to engage the polishing surface substantially adjacent to the perimeter portion of the wafer carrier and traveling with the wafer carrier while the wafer carrier moves the wafer over the polishing surface. (emphasis added).

Neither Cheng *et al.* nor Takanaka *et al.* teach or suggest a body adapted for attachment to a wafer carrier of a chemical-mechanical polishing machine with the body having a face positioned proximate to a perimeter portion of the wafer carrier and facing the polishing surface of the polishing pad, the body being adapted to travel with the wafer carrier as the wafer carrier moves over the polishing pad wherein the body is movably attached to the wafer carrier. Further, as discussed more fully above, the conditioning assembly 108 of Cheng *et al.* is attached to the housing assembly 102 and not the substrate backing member 120. Cheng *et al.* also teaches away from attaching the conditioning assembly 108 directly to the substrate backing member 120 since such an attachment would be blocked by the placement of a retaining ring assembly 106. In addition, attaching the conditioning assembly 108 directly to the substrate backing member 120 would prevent the flexible bladder 250 from performing its purpose of raising and lowering the conditioning assembly 108 relative to the substrate backing member 120.

The teachings of Cheng *et al.* also teach away from combination with Tanaka, since Cheng *et al.* teaches a flexible bladder with a pressurizable core which can be pressurized

or depressurized to urge a conditioning ring up or down relative to a substrate backing member. A combination of Cheng *et al.* with Takenaka would not work, since in Takenaka, the conditioning apparatus is fixedly attached to the substrate backing member, and thus the operation of a flexible bladder taught by Cheng *et al.* would be blocked and unable to perform as intended. The combination of elements in claim 1 is thus neither disclosed nor suggested by Cheng et al. nor Takenaka et al. either singly or in combination. Accordingly, the combination of elements in claim 1 is allowable.

Claim 13

Claim 13 recites a polishing machine for chemical-mechanical polishing of a semiconductor wafer, comprising a platen having an upper surface, a polishing pad positioned on the upper surface of the platen, the polishing pad having a polishing surface facing away from the platen, a wafer carrier for carrying the wafer, the wafer carrier being positioned over the polishing pad and moveable along an axis substantially normal to the upper surface of the platen to engage the wafer with the polishing pad, wherein at least one of the platen and the wafer carrier moves with respect to the other to impart relative motion between the wafer and the polishing pad, *and a pad refurbisher having a body with a face positioned proximate to a perimeter portion of the wafer carrier and facing generally towards the polishing surface and being attached to the wafer carrier so that the body and refurbishing element travel with the wafer carrier as the wafer carrier moves with respect to the polishing pad, wherein the refurbishing element engages the polishing surface substantially adjacent to the perimeter portion of the wafer carrier while the wafer carrier moves the wafer over the polishing surface and wherein the body is movably attached to the wafer carrier.* (emphasis added).

Neither Cheng *et al.* nor Takanaka *et al.* teach or suggest a pad refurbisher having a body with a face positioned proximate to a perimeter portion of the wafer carrier and facing generally towards the polishing surface and being attached to the wafer carrier so that the body and refurbishing element travel with the wafer carrier as the wafer carrier moves with respect to the polishing pad, wherein the refurbishing element engages the polishing surface substantially adjacent to the perimeter portion of the wafer carrier while the wafer carrier moves the wafer over the polishing surface and wherein the body is movably attached to the wafer carrier.

Further, as discussed more fully above, the conditioning assembly 108 of Cheng *et al.* is attached to the housing assembly 102 and not the substrate backing member 120. Cheng *et al.* also teaches away from attaching the conditioning assembly 108 directly to the substrate backing member 120 since such an attachment would be blocked by the placement of a retaining ring assembly 106. In addition, attaching the conditioning assembly 108 directly to the substrate backing member 120 would prevent the flexible bladder 250 from performing its purpose of raising and lowering the conditioning assembly 108 relative to the substrate backing member 120. The teachings of Cheng *et al.* also teach away from combination with Tanaka, since Cheng *et al.* teaches a flexible bladder with a pressurizable core which can be pressurized or depressurized to urge a conditioning ring up or down relative to a substrate backing member. A combination of Cheng *et al.* with Takenaka would not work, since in Takenaka, the conditioning apparatus is fixedly attached to the substrate backing member, and thus the operation of a flexible bladder taught by Cheng *et al.* would be blocked and unable to perform as intended. The combination of elements in claim 13 is thus neither disclosed nor suggested by Cheng et al. nor Takenaka et al. either singly or in combination. The combination of elements recited in claim 13 is thus allowable.

Claim 25

Claim 25 recites a method for refurbishing a polishing pad, comprising the steps of *providing a pad refurbisher having a body with a face positioned proximate to a perimeter portion of a wafer carrier of a chemical-mechanical polishing machine and facing generally towards the polishing surface*, and a refurbishing element connected to the face of the body, *the body being movably attached to the wafer carrier*, engaging the pad refurbishing element with the polishing pad, and moving at least one of the wafer carrier and the polishing pad with respect to the other to pass the refurbishing element across the polishing pad. (emphasis added).

Neither Cheng *et al.* nor Takanaka *et al.* teach or suggest providing a pad refurbisher having a body with a face positioned proximate to a perimeter portion of a wafer carrier of a chemical-mechanical polishing machine and facing generally towards the polishing surface. Nor do Cheng *et al.* nor Takanaka *et al.* teach or suggest the body being movably attached to the wafer carrier. Rather, as discussed more fully above, the conditioning assembly

108 of Cheng *et al.* is attached to the housing assembly 102 and not the substrate backing member 120. Cheng *et al.* also teaches away from attaching the conditioning assembly 108 directly to the substrate backing member 120 since such an attachment would be blocked by the placement of a retaining ring assembly 106. In addition, attaching the conditioning assembly 108 directly to the substrate backing member 120 would prevent the flexible bladder 250 from performing its purpose of raising and lowering the conditioning assembly 108 relative to the substrate backing member 120. The teachings of Cheng *et al.* also teach away from combination with Tanaka, since Cheng *et al.* teaches a flexible bladder with a pressurizable core which can be pressurized or depressurized to urge a conditioning ring up or down relative to a substrate backing member. A combination of Cheng *et al.* with Takenaka would not work, since in Takenaka, the conditioning apparatus is fixedly attached to the substrate backing member, and thus the operation of a flexible bladder taught by Cheng *et al.* would be blocked and unable to perform as intended. The method of claim 25 is thus neither disclosed nor suggested by Cheng et al. nor Takenaka et al. either singly or in combination. Accordingly, the combination of elements recited in claim 25 is allowable over the cited references.

Claim 31

Claim 31 recites a pad refurbisher for refurbishing a polishing surface on a polishing pad used in chemical-mechanical polishing of a semiconductor wafer, comprising *a body adapted for attachment to a wafer carrier of a chemical-mechanical polishing machine with the body having a face positioned proximate to a perimeter portion of the wafer carrier and facing the polishing surface of the polishing pad*, and a refurbishing element connected to the face of the body, the refurbishing element being adapted to engage the polishing surface substantially adjacent to the perimeter portion of the wafer carrier. (emphasis added).

Neither Cheng *et al.* nor Takanaka *et al.* teach or suggest a body adapted for attachment to a wafer carrier of a chemical-mechanical polishing machine with the body having a face positioned proximate to a perimeter portion of the wafer carrier and facing the polishing surface of the polishing pad. Rather, as discussed more fully above, the conditioning assembly 108 of Cheng *et al.* is attached to the housing assembly 102 and not the substrate backing member 120. Cheng *et al.* also teaches away from attaching the conditioning assembly 108

directly to the substrate backing member 120 since such an attachment would be blocked by the placement of a retaining ring assembly 106. In addition, attaching the conditioning assembly 108 directly to the substrate backing member 120 would prevent the flexible bladder 250 from performing its purpose of raising and lowering the conditioning assembly 108 relative to the substrate backing member 120. The teachings of Cheng *et al.* also teach away from combination with Tanaka, since Cheng *et al.* teaches a flexible bladder with a pressurizable core which can be pressurized or depressurized to urge a conditioning ring up or down relative to a substrate backing member. A combination of Cheng *et al.* with Takenaka would not work, since in Takenaka, the conditioning apparatus is fixedly attached to the substrate backing member, and thus the operation of a flexible bladder taught by Cheng *et al.* would be blocked and unable to perform as intended. The combination of elements in claim 31 is thus neither disclosed nor suggested by Cheng et al. nor Takenaka et al. either singly or in combination. The combination of elements recited in claim 31 is therefore allowable.

Claim 43

Claim 43 recites a polishing machine for chemical-mechanical polishing of a semiconductor wafer, comprising a platen having an upper surface, a polishing pad positioned on the upper surface of the platen, the polishing pad having a polishing surface facing away from the platen, a wafer carrier for carrying the wafer, and *a pad refurbisher having a body attached to the wafer carrier and having a refurbishing element.* (emphasis added).

Neither Cheng *et al.* nor Takanaka *et al.* teach or suggest a pad refurbisher having a body attached to the wafer carrier and having a refurbishing element. Rather, as discussed more fully above, the conditioning assembly 108 of Cheng *et al.* is attached to the housing assembly 102 and not the substrate backing member 120. Cheng *et al.* also teaches away from attaching the conditioning assembly 108 directly to the substrate backing member 120 since such an attachment would be blocked by the placement of a retaining ring assembly 106. In addition, attaching the conditioning assembly 108 directly to the substrate backing member 120 would prevent the flexible bladder 250 from performing its purpose of raising and lowering the conditioning assembly 108 relative to the substrate backing member 120. The teachings of Cheng *et al.* also teach away from combination with Tanaka, since Cheng *et al.* teaches a flexible

bladder with a pressurizable core which can be pressurized or depressurized to urge a conditioning ring up or down relative to a substrate backing member. A combination of Cheng *et al.* with Takenaka would not work, since in Takenaka, the conditioning apparatus is fixedly attached to the substrate backing member, and thus the operation of a flexible bladder taught by Cheng *et al.* would be blocked and unable to perform as intended. The combination of elements in claim 43 is thus neither disclosed nor suggested by Cheng et al. nor Takenaka et al. either singly or in combination. Accordingly, the combination of elements in claim 43 is allowable.

Claim 47

Claim 47 recites a method for refurbishing a polishing pad, comprising the steps of *providing a pad refurbisher attached to a wafer carrier, the pad refurbisher having a refurbishing element, selectively engaging the pad refurbishing element with the polishing pad*; and moving at least one of the wafer carrier and the polishing pad with respect to the other to pass the refurbishing element across the polishing pad. (emphasis added).

Neither Cheng *et al.* nor Takanaka *et al.* teach or suggest providing a pad refurbisher attached to a wafer carrier, the pad refurbisher having a refurbishing element or selectively engaging the pad refurbishing element with the polishing pad. Rather, as discussed more fully above, the conditioning assembly 108 of Cheng *et al.* is attached to the housing assembly 102 and not the substrate backing member 120. Cheng *et al.* also teaches away from attaching the conditioning assembly 108 directly to the substrate backing member 120 since such an attachment would be blocked by the placement of a retaining ring assembly 106. In addition, attaching the conditioning assembly 108 directly to the substrate backing member 120 would prevent the flexible bladder 250 from performing its purpose of raising and lowering the conditioning assembly 108 relative to the substrate backing member 120. The teachings of Cheng *et al.* also teach away from combination with Tanaka, since Cheng *et al.* teaches a flexible bladder with a pressurizable core which can be pressurized or depressurized to urge a conditioning ring up or down relative to a substrate backing member. A combination of Cheng *et al.* with Takenaka would not work, since in Takenaka, the conditioning apparatus is fixedly attached to the substrate backing member, and thus the operation of a flexible bladder taught by Cheng *et al.* would be blocked and unable to perform as intended. The method of claim 47 is

thus neither disclosed nor suggested by Cheng et al. nor Takenaka et al. either singly or in combination. The combination of elements recited in claim 47 is thus allowable.

The claims dependent on the independent claims discussed above are allowable for the same reasons as the independent claims, and because of the additional limitations added by the dependent claims.

Attached hereto is a marked-up version of the changes made to the specification by the current amendment. The attached page is captioned **"Version with Markings to Show Changes Made"**.

All pending claims are in condition for allowance, and favorable consideration and a Notice of Allowance are respectfully requested. The Examiner is requested to contact the undersigned at the number listed below for a telephone interview if, upon consideration of this amendment, the Examiner determines any pending claims are not in condition for allowance. The undersigned also requests the Examiner to direct all future correspondence to the address set forth below in the event the Examiner shows a different correspondence address for the attorney of record.

Respectfully submitted,

DORSEY & WHITNEY LLP

Paul F. Rusyn
Registration No. 42,118

PFR:asw

Enclosures:

Postcard
Copy of Previously Submitted Check (in the amount of $666)
Fee Transmittal Sheet (+ copy)

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Paragraph beginning at line 18 of column 2 has been amended as follows:

CMP processes must also consistently and accurately produce a uniform, planar surface on the wafer because it is important to accurately focus the image of circuit patterns on the surface of the wafer. As the density of integrated circuits increases, it is often necessary to accurately focus the critical dimensions of the circuit pattern to better than a tolerance of approximately 0.1 μm. Focusing the circuit patterns to such small tolerances, however, is very difficult when the distance between the emission source and the surface of the wafer varies because the surface of the wafer is not uniformly planar. In fact, several devices may be defective on a wafer with a non-~~uniformnly~~ uniformly planar surface. Thus, CMP processes must create a highly uniform, planar surface.